Trend Study 20-2-03

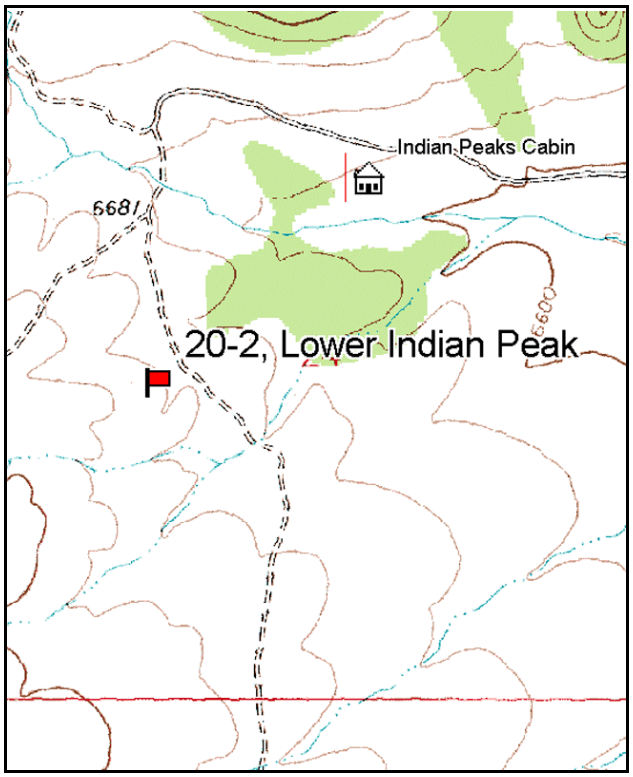
Study site name: Lower Indian Peak . Vegetation type: Chained, Seeded P-J .

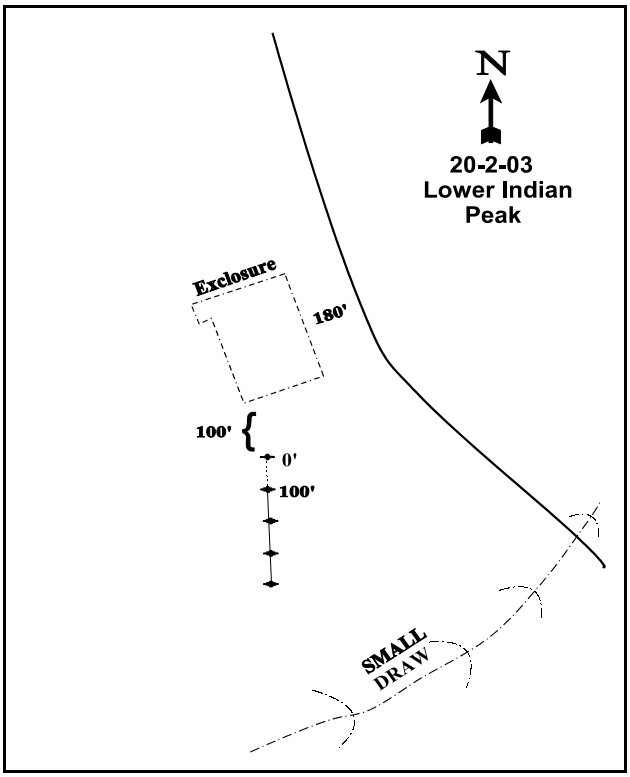
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (71ft), line 3 (34ft), line 4 (59ft). Rebar: belt 1 on 6ft, belt 5 on 1ft, belt 3 on 8ft.

LOCATION DESCRIPTION

From the Indian Peaks state cabin travel 0.4 miles west to a fork, turn left. Turn left and cross the stream. Continue 0.1 miles and turn left at the fork. Go 0.30 miles to an exclosure which is about 180 feet off the right side of the road. The frequency baseline starts 100 feet south (in line with the fence) of the southwest corner of the exclosure. The 0-foot baseline stake is a rebar with browse tag #7076 attached.





Map Name: Buckhorn Spring

Diagrammatic Sketch

Township 29S , Range 18W , Section 24

GPS: NAD 27, UTM 12S 4239423 N, 253743 E

DISCUSSION

Lower Indian Peak - Trend Study No. 20-2

The Lower Indian Peak study is located on a chained and seeded section of DWR land. One hundred acres were treated in 1959 by chaining and drilling with a mixture of grasses, forbs, and browse species. The area is now dominated by perennial grasses with scattered sagebrush and pinyon-juniper. The terrain is gently sloping with a generally eastern aspect and an elevation of 6,770 feet. Deer use in this open area appears light. Pellet group counts in 1991 estimated only 2 deer and 3 elk days use/acre (5 ddu/ha and 7 edu/ha). Pellet group data from 1998 estimated 7 deer, 16 elk and 6 cow days use/acre (17 ddu/ha, 40 edu/ha and 15 cdu/ha). Pellet group data from 2003 estimated increased big game use at 11 deer days use/acre (27 ddu/ha) and 44 elk days use/acre (109 edu/ha). Rabbit sign was abundant with a quadrat frequency of 57% in 2003.

The soil is quite variable in depth and rocky with an effective rooting depth estimated at 14 inches. Variable soil depth is evident with the presence of the shallow rooted black sagebrush over most of the site as well as the deeper rooted mountain big sagebrush which is found in areas of deeper soil. Soil texture is a sandy loam which is slightly acidic (pH 6.4). Many large rocks are found on the surface. Along with this and erosion pavement, rock covers almost one-third of the soil surface. Buildup of litter is limited to mostly remnants of old pinyon-juniper chaining slash. Some erosion does occur, but appears insignificant at this time.

Key browse species include black sagebrush and mountain big sagebrush. There are also low numbers of bitterbrush and green ephedra which provide some additional preferred forage. Mountain sagebrush and black sagebrush are present in relatively low numbers. Since 1998, mountain big sagebrush has decreased both in cover (3.9 to 1.9%) and strip frequency (21 to 12%), while conversely black sagebrush has increased in both cover (2.0 to 4.8%) and strip frequency (30 to 33%). It would appear that initially the extended drought has had more of an effect on the low elevation accession of mountain big sagebrush than to black sagebrush. The data demonstrates that as mountain big sagebrush has thinned out with the stress of drought, percent decadence went down. Conversely, black sagebrush has become more dense, and with increased intraspecific competition between individual plants, black sagebrush decadence has increased with drought. Use has continued to be mostly light to moderate for both sagebrush species.

Bitterbrush was not sampled in 1985 or 1991. Typically they are in low numbers and always show heavy hedging. A small number were picked up in the larger sample used in 1998. All displayed extremely heavy use. Even though they have increased in numbers since 1991, they still contribute only 7% of the total browse cover. The most abundant shrub on the site in 1985 was the undesirable increaser species, broom snakeweed with a density of 3,732 plants/acre. Since then their numbers have decreased by almost 90% and they provide less than 1% of the browse cover on the site.

Young pinyon are scattered throughout the area and may begin to have more of an influence on the surrounding vegetation. There has been a slight increase in density for singleleaf pinyon since 1991. In 2003, almost 70% of the trees were greater than 8 feet in height, where only 25% were in this height category in 1991. Juniper tree density has also slightly increased since 1991. Currently (‘03), 62% are over 8 feet in height, where before 58% were over 8 feet. This would indicate that there has been little change in their height structure. No seedling pinyon or juniper were encountered. Average basal diameter has increased substantially for both species since 1991. Average basal diameter was estimated at 5.5 inches for pinyon and 7.1 inches for juniper in 2003. Only juniper trees were found to be tipped over from the chaining, and that would be less than 10%. Pinyon and juniper dominant the surrounding area, making the rehabilitated areas very valuable to wintering big game.

The herbaceous understory is diverse and moderately productive, and dominated by perennial grasses.

Common species include seeded crested and intermediate wheatgrass, and smooth brome which accounted for 77% of the grass cover in 1998. The grass composition has become increasingly dominated by crested wheatgrass due to declines in frequency and cover of other species since 1998. Cheatgrass was quite common in 1998 when it provided 14% of the grass cover. With low precipitation since 1998, cheatgrass had significantly lower cover and nested frequency values in 2003. The area was heavily utilized by trespassing cattle in the past. They concentrate on the treated sites, resulting in depressed vigor of the grasses. Some trespass grazing still occurs but at a much lower rate. Forbs are still very scarce, and those found are not especially valuable species. The species encountered still only produce just about ½ of 1% cover.

1985 APPARENT TREND ASSESSMENT

The vegetative and soil trends were both effected by the pinyon-juniper rehabilitation work. Soil erosion is continuing at a slow rate. The lack of litter and vegetative cover on much of the area perpetuates this erosion. Vegetative trend may be up for a while on grasses and sagebrush. Christmas tree sales and firewood cutting should be encouraged to reduce the encroachment of pinyon and juniper and prolong the longevity of the seeding. Closer regulation of cattle grazing is also important.

1991 TREND ASSESSMENT

The soil trend is slightly down. Erosion from high intensity summer thunder storms was noticeable, but doesn't appear to be a major problem. Basal vegetative cover dropped by over 50% and bare ground increased by 28%. The browse trend is stable. Density has increased slightly for black sagebrush and there are reduced numbers of broom snakeweed. Use is heavier on black sagebrush, and reproduction continues to be poor. Pinyon and juniper trees number approximately 78 trees per acre, most of which are in the 4 to 8 foot height class. None were classified as seedlings. Follow up treatment on these trees should be considered to encourage increases in the browse and herbaceous vegetation. The grass trend is stable with similar sum of nested frequency values between readings. Forbs are not numerous enough to be of importance on this site.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - stable (3)

1998 TREND ASSESSMENT

Trend for soil is stable. There is some slight improvements in protective ground cover values, although not enough to warrant an upward trend. Trend for the key browse, mountain big sagebrush and black sagebrush, appears stable. The slight decline in density for black sagebrush appears to be caused by the larger sample used in 1998. Utilization is slightly lighter, vigor good, and decadence low at only 5%. Density of the increaser/invader broom snakeweed continues to decline with only 180 plants/acre currently estimated. Trend for the perennial herbaceous understory is down slightly due to a decline in the sum of nested frequency of perennial grasses. Most of the losses in perennial nested frequency value was by intermediate wheatgrass which declined significantly. Forbs occur at similar low frequencies.

TREND ASSESSMENT
soil - stable (3)
browse - stable (3)
herbaceous understory - down slightly (2)

2003 TREND ASSESSMENT

Trend for soil is down because of a substantial decrease in vegetative cover and increase in bare soil. There has been an overall decrease in the ratio of protective ground cover to bare soil. Trend for the key browse, which is made up of mostly three species, black sagebrush, mountain big sagebrush and bitterbrush, appears slightly down. There has been a large increase in black sagebrush, where cover has more than doubled since 1998. Meanwhile, cover for mountain big sagebrush has decreased by 51%. Its density has also dropped dramatically from 500 to 240 plants/acre. Mountain big sagebrush now only makes up 14% of the browse cover where in 1998 it made up 35%. Both sagebrush are showing slightly increased utilization. We have lost a good number of mountain big sagebrush, yet numbers for black sagebrush are slightly up. However, percent decadence has greatly increased for black sagebrush. Overall, trend would be considered slightly down for the sagebrushes as they contribute 50% of the total browse cover. Density of the increaser/invader broom snakeweed has increased slightly from 1998, yet it still makes up less than one-tenth of 1% of the browse cover. Trend for the perennial herbaceous understory is down, due mostly to the loss of crested wheatgrass which contributed 75% of the perennial herbaceous cover in 1998. Currently, its cover has decreased by almost 70% and its nested frequency value has also significantly decreased. Forbs occur at similar low frequencies.

TREND ASSESSMENT
soil - down (1)
browse - slightly down (2)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Management unit 20 , Study no: 2

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron cristatum	$_{b}$256	$_{b}$241	$_{b}$230	$_{a}$156	12.79	3.93
G	Agropyron dasystachyum	16	2	1	1	.00	.00
G	Agropyron intermedium	$_{a}$32	$_{b}$86	$_{a}$28	$_{a}$18	1.25	.26
G	Aristida purpurea	$_{ab}$18	$_{b}$37	$_{a}$7	$_{a}$14	.06	.10
G	Bouteloua gracilis	$_{a}$-	$_{b}$19	$_{a}$1	$_{a}$-	.00	-
G	Bromus inermis	$_{ab}$25	$_{ab}$19	$_{b}$46	$_{a}$6	1.26	.04
G	Bromus tectorum (a)	-	-	$_{b}$184	$_{a}$34	2.86	.34
G	Elymus junceus	$_{b}$87	$_{a}$18	$_{a}$9	$_{a}$5	.05	.03
G	Oryzopsis hymenoides	-	-	-	1	-	.00
G	Poa bulbosa	$_{a}$-	$_{a}$-	$_{b}$23	$_{b}$36	.29	.99
G	Poa fendleriana	-	-	7	-	.21	-
G	Poa secunda	$_{a}$-	$_{a}$-	$_{b}$20	$_{a}$4	.25	.01
G	Sitanion hystrix	$_{b}$19	$_{ab}$6	$_{b}$11	$_{a}$-	.72	-
G	Stipa comata	-	-	3	6	.04	.21
Total for Annual Grasses		0	0	184	34	2.86	0.34
Total for Perennial Grasses		453	428	386	247	16.96	5.60
Total for Grasses		453	428	570	281	19.83	5.94
F	Astragalus cibarius	2	3	-	2	-	.15
F	Cymopterus spp.	-	-	2	-	.00	-
F	Draba spp. (a)	-	-	$_{b}$36	$_{a}$-	.13	-
F	Erigeron pumilus	$_{b}$8	$_{a}$-	$_{a}$3	$_{a}$-	.03	-
F	Gilia spp. (a)	-	-	$_{a}$19	$_{b}$48	.05	.19
F	Lappula occidentalis (a)	-	-	1	-	.00	-
F	Leucelene ericoides	$_{a}$-	$_{b}$15	$_{a}$2	$_{a}$-	.00	-
F	Navarretia intertexta (a)	-	-	-	2	-	.00
F	Penstemon palmeri	-	3	-	-	-	-
F	Phlox austromontana	4	7	10	4	.37	.04
F	Senecio multilobatus	-	-	1	-	.00	-
F	Sphaeralcea coccinea	3	-	2	1	.01	.00
F	Streptanthus cordatus	-	-	-	3	-	.00
F	Unknown forb-perennial	2	1	-	-	-	-
Total for Annual Forbs		0	0	56	50	0.18	0.19
Total for Perennial Forbs		19	29	20	10	0.42	0.19
Total for Forbs		19	29	76	60	0.60	0.39

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 20 , Study no: 2

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia nova	30	33	1.95	4.79
B	Artemisia tridentata vaseyana	21	12	3.90	1.91
B	Chrysothamnus nauseosus hololeucus	4	1	.15	.00
B	Chrysothamnus parryi	0	1	-	.00
B	Chrysothamnus viscidiflorus viscidiflorus	2	3	.38	.03
B	Echinocereus spp.	1	3	-	-
B	Ephedra viridis	2	1	.15	.66
B	Gutierrezia sarothrae	7	12	.03	.15
B	Juniperus osteosperma	4	4	3.90	4.23
B	Opuntia spp.	1	0	-	-
B	Opuntia whipplei	1	0	.00	-
B	Pediocactus simpsonii	0	3	-	.03
B	Pinus monophylla	0	0	.00	.56
B	Purshia tridentata	2	2	.53	1.00
B	Sclerocactus	1	0	.03	-
Total for Browse		76	75	11.03	13.39

CANOPY COVER, LINE INTERCEPT --
Management unit 20 , Study no: 2

Species	Percent Cover	
	'98	'03
Artemisia nova	-	3.46
Artemisia tridentata vaseyana	-	1.01
Chrysothamnus viscidiflorus viscidiflorus	-	.16
Ephedra viridis	-	.40
Gutierrezia sarothrae	-	.18
Juniperus osteosperma	3.00	5.88
Pinus monophylla	-	.36
Purshia tridentata	-	.46

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 20 , Study no: 2

Species	Average leader growth (in) '03
Artemisia tridentata vaseyana	1.9
Purshia tridentata	2.8

POINT-QUARTER TREE DATA --
Management unit 20 , Study no: 2

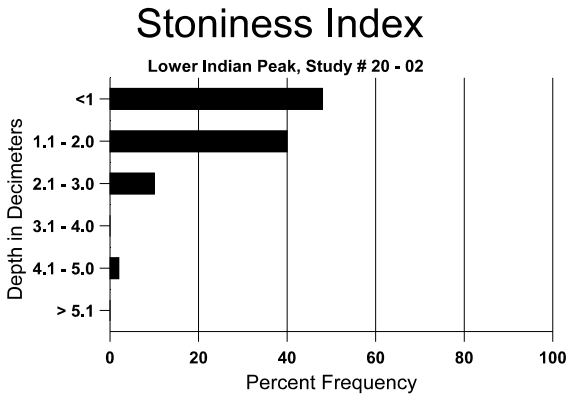
Species	Trees per Acre '98	Trees per Acre '03	Average diameter (in) '98	Average diameter (in) '03
Juniperus osteosperma	22	29	4.8	7.1
Pinus monophylla	78	78	4.2	5.5

BASIC COVER --
Management unit 20 , Study no: 2

Cover Type	Average Cover % '85	'91	'98	'03
Vegetation	8.75	4.00	34.35	19.46
Rock	14.25	22.00	13.17	13.34
Pavement	23.25	16.25	10.75	14.92
Litter	36.00	32.50	37.12	34.44
Cryptogams	0	.25	1.24	.58
Bare Ground	17.75	25.00	21.53	27.68

SOIL ANALYSIS DATA --
Management unit 20, Study no: 2, Study Name: Lower Indian Peak

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
13.9	68.7 (6.2)	6.4	64.0	17.4	18.6	2.1	12.7	99.2	0.6



PELLET GROUP DATA --
Management unit 20 , Study no: 2

Type	Quadrat Frequency	
	'98	'03
Rabbit	25	57
Elk	8	36
Deer	3	4
Cattle	-	-

Days use per acre (ha)	
'98	'03
-	-
16 (40)	44 (109)
7 (17)	11 (26)
6 (15)	-

BROWSE CHARACTERISTICS --
Management unit 20 , Study no: 2

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia frigida											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	5/11
Artemisia nova											
85	**1333**	133	600	733	-	-	15	0	0	0	11/13
91	**1533**	-	600	933	-	-	43	13	0	0	9/16
98	**1320**	220	280	980	60	40	20	2	5	0	9/22
03	**1420**	-	100	720	600	240	32	1	42	7	10/20
Artemisia tridentata vaseyana											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**500**	40	20	360	120	20	16	4	24	4	21/34
03	**240**	-	60	140	40	60	50	0	17	8	20/35
Chrysothamnus nauseosus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	16/35
Chrysothamnus nauseosus hololeucus											
85	**266**	-	-	66	200	-	0	0	75	0	8/9
91	**266**	-	-	66	200	-	25	0	75	75	20/22
98	**100**	-	-	60	40	-	40	0	40	40	19/23
03	**20**	-	-	-	20	-	0	0	100	0	21/30

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Chrysothamnus parryi											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**20**	-	20	-	-	-	0	0	-	0	-/-
Chrysothamnus viscidiflorus viscidiflorus											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**132**	-	66	66	-	-	50	50	0	0	7/22
98	**40**	-	-	40	-	-	0	0	0	0	13/23
03	**60**	-	-	40	20	-	0	0	33	33	13/24
Echinocereus spp.											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	4/12
03	**60**	-	-	60	-	-	0	0	-	0	3/7
Ephedra viridis											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**40**	-	20	20	-	-	50	0	0	50	27/39
03	**20**	-	-	-	20	-	100	0	100	100	25/38
Gutierrezia sarothrae											
85	**3732**	2266	1266	2066	400	-	5	0	11	0	6/7
91	**1732**	3066	1400	266	66	-	0	0	4	0	5/6
98	**180**	40	-	100	80	40	0	0	44	44	5/7
03	**420**	-	-	300	120	20	0	0	29	0	8/9
Juniperus osteosperma											
85	**66**	-	-	66	-	-	0	0	-	0	69/83
91	**66**	-	-	66	-	-	0	0	-	0	138/91
98	**80**	-	-	80	-	60	0	0	-	0	-/-
03	**80**	-	20	60	-	-	0	0	-	0	-/-
Opuntia spp.											
85	**66**	-	-	66	-	-	0	0	0	0	2/4
91	**66**	-	-	-	66	-	0	0	100	0	-/-
98	**20**	-	-	20	-	-	0	0	0	0	-/-
03	**0**	-	-	-	-	-	0	0	0	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Opuntia whipplei											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	4/11
03	**0**	-	-	-	-	-	0	0	-	0	4/11
Pediocactus simpsonii											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**60**	-	-	60	-	-	0	0	-	0	2/2
Pinus monophylla											
85	**66**	-	66	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	20	0	0	-	0	-/-
Purshia tridentata											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**40**	-	-	20	20	-	0	100	50	50	21/60
03	**60**	-	-	-	60	-	0	100	100	0	21/68
Rhus trilobata											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**0**	-	-	-	-	-	0	0	-	0	25/70
Sclerocactus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**20**	-	-	20	-	-	0	0	-	0	2/3
03	**0**	-	-	-	-	-	0	0	-	0	-/-